



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : H04N 7/16, 7/167	A1	(11) International Publication Number: WO 00/44172 (43) International Publication Date: 27 July 2000 (27.07.00)
(21) International Application Number: PCT/US00/00536 (22) International Filing Date: 10 January 2000 (10.01.00) (30) Priority Data: 09/234,559 20 January 1999 (20.01.99) US (63) Related by Continuation (CON) or Continuation-in-Part (CIP) to Earlier Application US 09/234,559 (CON) Filed on 20 January 1999 (20.01.99) (71) Applicant (for all designated States except US): INTEL CORPORATION [US/US]; 2200 Mission College Blvd., Santa Clara, CA 95052 (US). (72) Inventor; and (75) Inventor/Applicant (for US only): RAMAKESAVAN, Sundaram [CA/US]; 5189 W. Saragosa Street, Chandler, AZ 85226 (US). (74) Agent: TROP, Timothy, N.; Trop, Pruner, Hu & Miles, P.C., 8554 Katy Freeway, Suite 100, Houston, TX 77024 (US).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>
(54) Title: SYSTEM FOR PROVIDING VIDEO ON DEMAND		
(57) Abstract <p>A system (10) for providing video upon request may transmit encrypted video information (16) to one or more recipients (12) for viewing at a later time. The recipient (12) may make a request to view one of the received video files. This request may be provided to a video transmitter (14) which may provide, in return, video decryption information to allow immediate viewing of the previously received video transmission.</p> <pre> graph TD 14[Video Provider 14] <--> 18 12[Processor / TV 12] 12 -- 16 --> 14 12 <--> 20 20[Network 20] 12 -- 22 --> 22[22] 12 -- 24 --> 24[24] 10((10)) --> 14 10 --> 20 10 --> 12 </pre>		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

System For Providing Video On Demand

Background

This invention relates generally to providing video information to a plurality of users in a video distribution system.

Current video distribution systems include pay per view systems which are available from cable and satellite television providers. In these systems, a variety of different pay per view movies are offered for viewing at a plurality of different times. The user must either join the video in progress or wait until a preset time when a new video begins. By offering a plurality of different starting times, these systems attempt to provide an approximation of video on demand.

In order to provide the video to a plurality of users at the exact times when they would like to have it, one might expect that a large bandwidth would be necessary. That is, given a large number of viewers, it would seem to be difficult to transmit different videos at a plurality of times given the bandwidth available with existing satellite and cable video distribution systems.

This means that the system users must accommodate their viewing desires to the existing bandwidth limitations of the video distribution system. Where those viewing desires do not correspond with the capabilities of existing systems, potential customers are lost.

Thus, it would be desirable to provide a video distribution system which permits video distribution upon demand from the user.

Summary

In accordance with one embodiment, a receiver for receiving video information from a video transmitter includes a storage medium for storing video information received by the receiver. A decryption engine is adapted to decrypt the stored video information. A controller is adapted to control the video storage medium and the decryption engine and to request decryption information for the engine.

Description of the Drawings

Figure 1 is a schematic depiction of a video distribution network in accordance with one embodiment of the present invention;

Figure 2 shows a flow chart for implementing a receiver in accordance with the system shown in Figure 1; and

Figure 3 is a block diagram showing one system for implementing the receiver shown in Figure 1.

5

Detailed Description

Referring to Figure 1, a video distribution system 10 may be implemented in a variety of different video distribution environments including cable, television broadcast, or satellite as examples. The video provider 14, which may be a cable provider or a satellite system provider as examples, transmits video, as indicated at 16, to a plurality of receivers 12 which may be processor based television receivers. The processor based television receivers may, for example, be so called set-top computer systems which use a television receiver as a display. Alternatively other computer systems and appliances may be used as well.

Instead of transmitting the video at a set or predetermined time corresponding to the time the video will be viewed, the video may be continually or semi-continuously streamed to all of the receivers in an encrypted form. Alternatively the video may simply be transmitted in advance and stored on a plurality of receivers. The individual receivers 12 may not be capable (without additional information) of displaying the transmitted video information. Thus, to the extent possible given the bandwidth of the system, video may be transmitted to the receiver 12 and stored thereon, for example in a memory 22, for viewing at a later time.

When a user desires to view particular video information, such as a movie, at any time, the user may simply request the decryption information, for example, from the video provider 14. In a two-way transmission scheme the request for decryption information may be transmitted over the same transport that conveyed the video. Alternatively, a separate medium or channel may be used. In addition, the decryption information may be requested from a source different from the video provider 14, in one embodiment of the invention.

The decryption information may then be transmitted with unrelated video information 16, in one example, to the receiver 12. For example, under control by the controller 15, the decryption information may be provided together with information about the intended recipient. Equipped with the decryption key for a particular video such as a movie, the receiver 12 can decrypt the video and allow the viewer to view the video on demand.

Where each of the receivers 12 includes a unique identifier and the decryption information is coded for the requesting receiver, only the receiver whose identifier matches an identifier transmitted with the decryption key is able to decode the decryption key for the requested video. In addition, when the receiver requests the decryption information, the receiver may not only be provided the decryption information, but appropriate billing provisions may be implemented as well.

Requests for the decryption information may be provided through a telephone network 20 as one example. As another example, the request may be made over an electronic network, such as the Internet using electronic mail. Thus, in effect a back channel may be used to request the decryption information from the video provider or other source in one embodiment. The video provider (or other source) then may provide not only the decryption information, but in one embodiment of the invention, the information needed to access the receiver's memory for the selected video information may also be provided. This access information may be provided as script or other software.

A predetermined amount of storage may be devoted to storing the video transmissions. When the video transmissions transmitted to a given receiver exceed the amount of dedicated storage, the oldest information may be deleted in order to make room to store the most recently received information. Alternatively, the video provider 14 may provide a signal each time it sends a new video to discard a particular video previously stored on a given receiver 12.

Since the video may be transmitted to the receiver 12, ahead of the viewing time, in one example, bandwidth limitations may be overcome. That is, the need to transmit a plurality of large video files at the same time to satisfy the demands of a large number of users is not necessary. Instead a set of video transmissions are streamed to all or part of a group of receivers which store those transmissions for later recall.

Referring now to Figure 2, software, in accordance with one embodiment, may be stored on the receiver 12 for implementing a video on demand system. The software 26 may begin by receiving and storing the encrypted video as indicated in block 28. In one embodiment, this may be done at particular times when volume in the transmission channel is low or the transmission may be done continuously or semi-continuously so as to store a library of video files on the receiver 12.

Upon request for video, as indicated in diamond 30, the receiver 12 requests a decryption key as indicated in block 32. This request may be carried over a back channel, in one embodiment of the invention, through a network 20 such as the Internet or a telephone network. Next, the video, stored in an encrypted form on the receiver 12, is retrieved as indicated in block 34. The video may then be automatically decrypted as indicated in block 36, and the display of the video may begin as indicated in block 38.

Generally, it may be desirable to transmit a decryption key for sections or portions of a given video. Thus, to view the entire video, the receiver must receive one or more video decryption keys, each of which may be used to decrypt a portion (less than all) of the video information. The advantage of this technique is that a pirate must obtain a number of video decryption keys in order to decrypt the entire video. This makes it harder to pirate the decryption keys, decreasing the likelihood of theft of services. For example, a new decryption key may be needed for each minute of video. Therefore, it may be desirable to transmit a new decryption key every minute, once an initial request for decryption information has been made.

If the user wishes to pause the ongoing video transmission (diamond 40), a signal may be sent, for example, over a back channel to the video provider 14 requesting a pause authorization (block 42). The video provider may respond by providing an acknowledgement number (block 44). When the user wishes to resume the video transmission, the user may simply press a "resume" key and provide the acknowledgement number. The video provider then knows when the particular receiver paused and provides the appropriate keys to allow the user to continue to view the rest of the video that was already requested, and presumably, billed.

Turning now to Figure 3, an example of a system that may be used as a receiver 12 is illustrated. The receiver 12 may include a processor 65 coupled to an accelerated graphics port (AGP) chipset 66. The Accelerated Graphics Port Specification, Rev 2.0, is available from Intel Corporation of Santa Clara, California. The chipset 66 may be coupled to system memory 68 and the accelerated graphics port bus 70. The bus 70 in turn may be coupled to a graphics accelerator 72, also coupled to a video or television receiver 73.

The chipset 66 may also be coupled to a bus 74 that receives a TV tuner/capture card 76. The card 76 may be coupled to a television antenna 78 which may also be a satellite antenna or a cable connection as additional examples. A connection to a network 90, such as

a modem connection to the Internet or a network controller connection to a computer network may also be provided.

The bus 74 is coupled to a bridge 80 which in turn is coupled to a hard disk drive 82. The hard disk drive 82 may store the software 26 and 46. The software 100 may be script
5 transmitted from the transmitter 14 to assist in locating stored video information.

The bridge 80 may in turn be coupled to another bus 84 which supports a serial output interface 86 and a BIOS 94. The interface 86 may be coupled to a modem 92 or a mouse 88.

While the present invention has been described with respect to a limited number of embodiments, those skilled in the art will appreciate numerous modifications and variations
10 therefrom. It is intended that the appended claims cover all such modifications and variations which fall within the true spirit and scope of the present invention.

1 What is claimed is:

1 1. A receiver for receiving video information from a video transmitter
2 comprising:
3 a storage medium for storing video information received by a receiver;
4 a decryption engine adapted to decrypt stored video information; and
5 a controller adapted to control the storage medium and the decryption engine
6 and request decryption information for the engine.

1 2. The receiver of claim 1 wherein said controller includes a processor.

1 3. The receiver of claim 1 wherein said engine is adopted to decrypt stored video
2 upon receipt of a request to view stored video.

1 4. A video transmission system comprising:
2 a video transmitter that transmits video to a plurality of receivers for display at
3 a later time; and
4 a controller that transmits decryption information to said receivers to enable
5 video upon request.

1 5. The system of claim 4 wherein said controller also is adapted to transmit an
2 identifier which identifies a particular receiver to receive said decryption information.

1 6. The system of claim 5 wherein said controller is part of said transmitter.

1 7. The system of claim 4 wherein said video transmitter transmits video over a
2 cable system.

1 8. The system of claim 4 wherein said video transmitter transmits video over a
2 satellite system.

1 9. The system of claim 4 wherein said transmitter also transmits information to
2 assist in locating particular video files transmitted by said transmitter to said receivers.

1 10. A video transmission method comprising:
2 storing encrypted video in a receiver; and
3 requesting a decryption key for said stored video.

1 11. The method of claim 10 including receiving the encrypted video from one
2 source and receiving the decryption key from a second source.

1 12. The method of claim 10 including receiving the video and said decryption key
2 from the same source.

1 13. The method of claim 10 including receiving an identifier to identify a
2 particular receiver to receive said key.

1 14. A video distribution method comprising:
2 storing video for selection by the recipient; and
3 upon request by the recipient, allowing the recipient to select for viewing
4 stored videos.

1 15. The method of claim 14 including providing a graphical user interface which
2 displays the video information which is available for selection by the user.

1 16. An article comprising a medium for storing instructions that cause a processor
2 based system to:
3 store video for selection by the recipient; and
4 upon request by a recipient, allow the recipient to select, for viewing, video
5 previously stored.

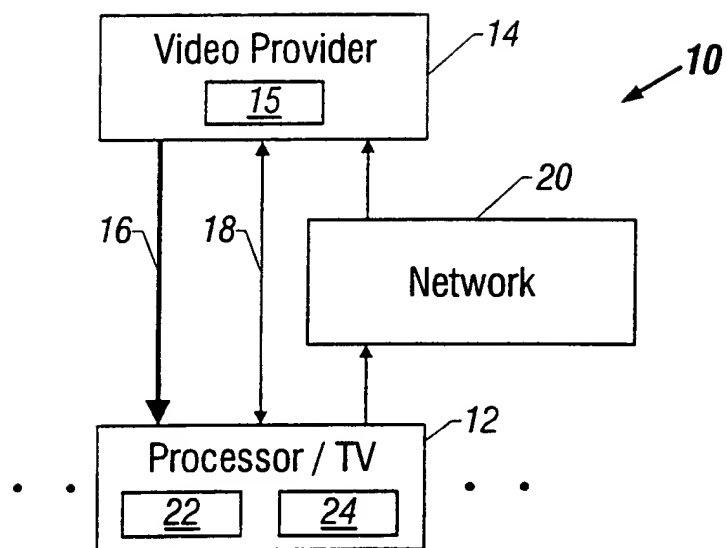
1 17. An article comprising a medium for storing instructions that cause a processor
2 based system to:
3 store encrypted video to a receiver; and
4 request a decryption key, for said stored video.

1 18. The article of claim 17 including instructions that cause a processor based
2 system to receive the encrypted video from one source and receive the decryption key from a
3 second source.

1 19. The article of claim 17 including instructions that cause a processor based
2 system to receive the video and said decryption key from the same source.

1 20. The article of claim 17 including instructions that cause a processor based
2 system to receive an identifier to identify a particular receiver to receive said key.

1/3

**FIG. 1**

2/3

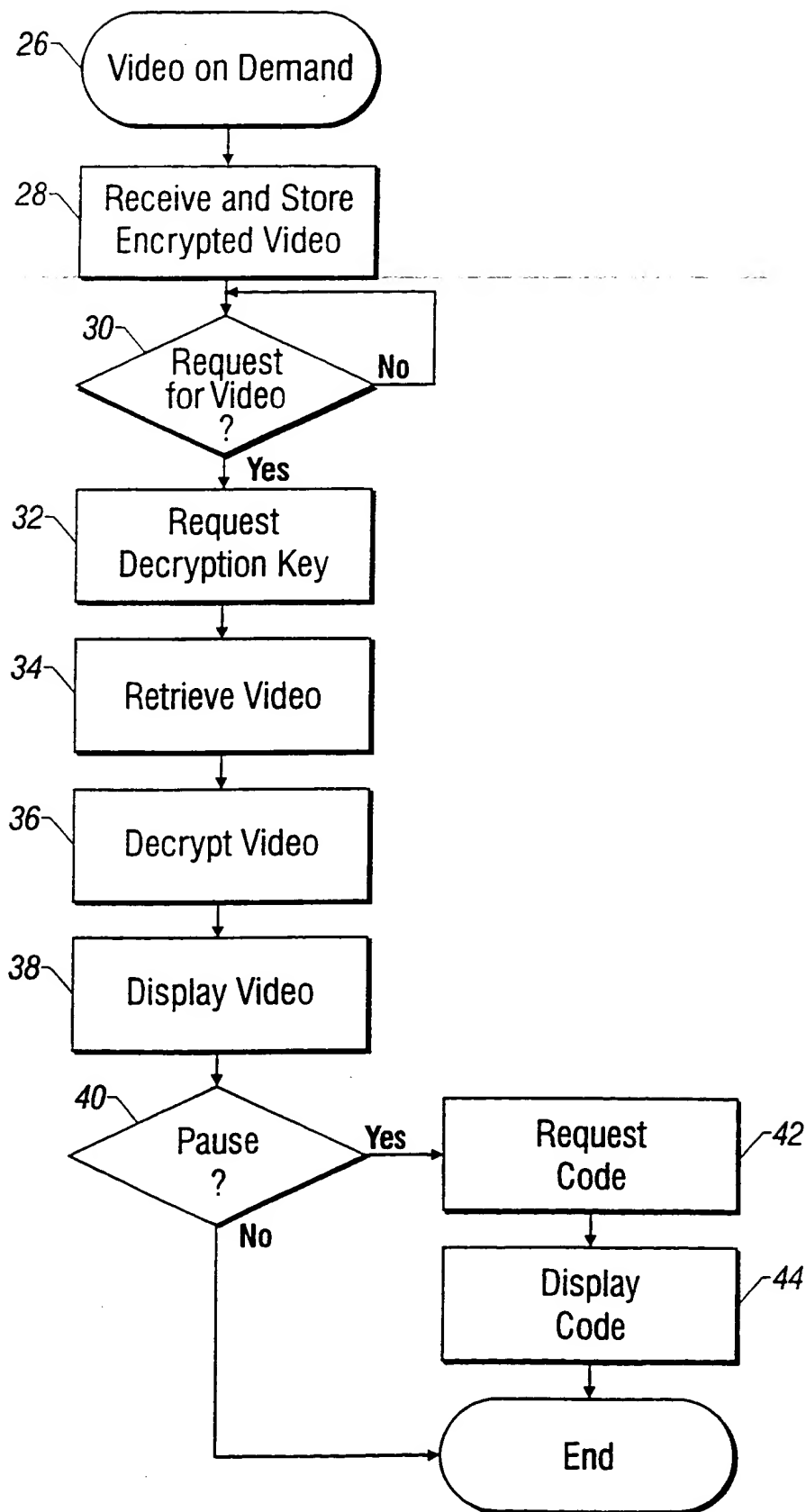


FIG. 2

3/3

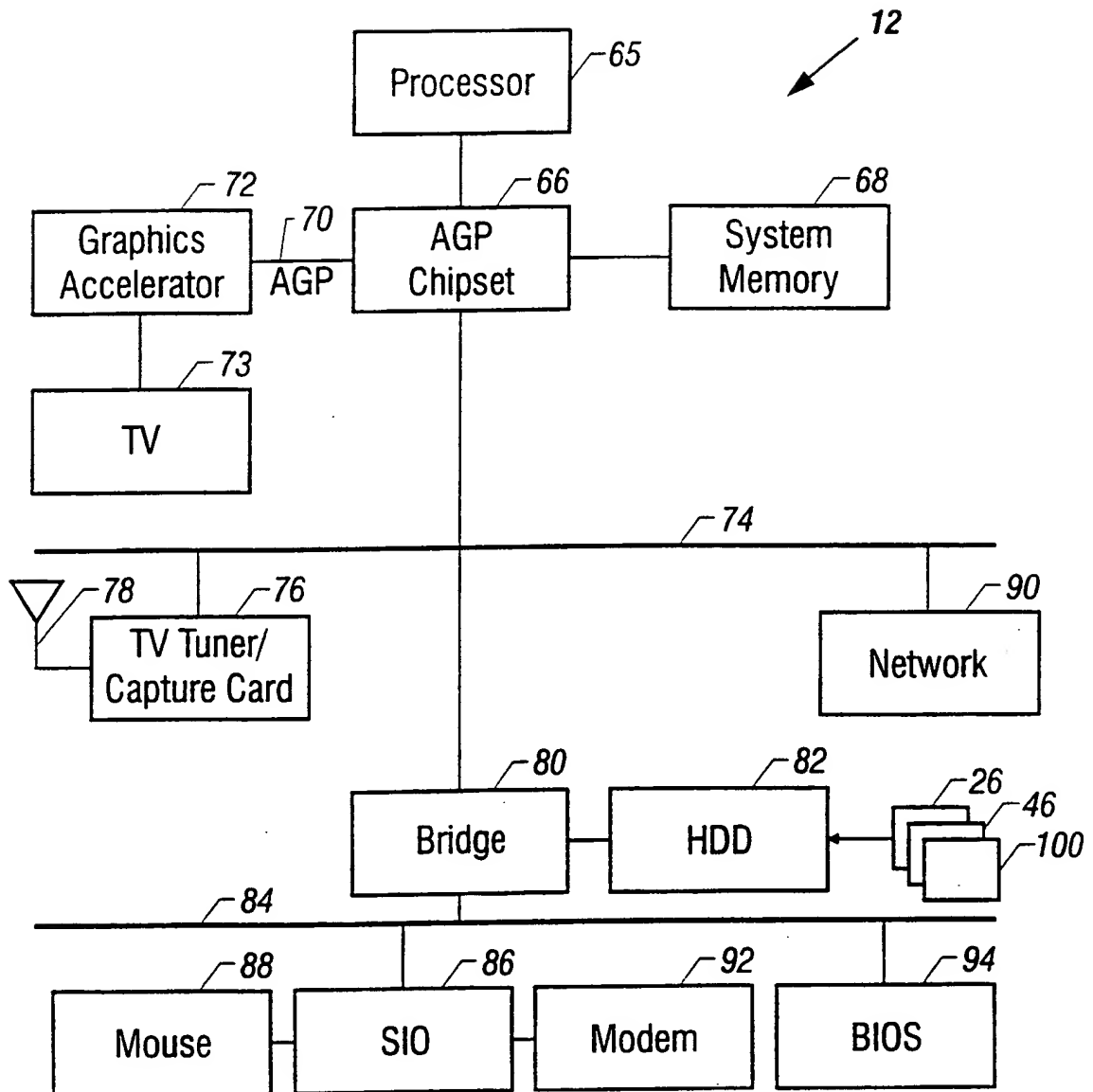


FIG. 3

INTERNATIONAL SEARCH REPORT

Inte. onal Application No

PCT/US 00/00536

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04N7/16 H04N7/167

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 450 841 A (GTE LABORATORIES INC) 9 October 1991 (1991-10-09)	1-8, 10-14, 16-20
A	column 1, line 50 -column 3, line 33; figure 1	9,15
A	EP 0 676 897 A (MITSUBISHI CORP) 11 October 1995 (1995-10-11) the whole document	1,4,10, 14,16,17
A	WO 96 17475 A (SCIENTIFIC ATLANTA) 6 June 1996 (1996-06-06) page 13, line 9 -page 15, line 17	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

G document member of the same patent family

Date of the actual completion of the international search

25 April 2000

Date of mailing of the international search report

02/05/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Beaudoin, O

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/00536

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0450841 A	09-10-1991	US 5054064 A	01-10-1991
		US 5046092 A	03-09-1991
		US 5046090 A	03-09-1991
		US 4991208 A	05-02-1991
		CA 2039123 A	30-09-1991
		DE 69121444 D	26-09-1996
		DE 69121444 T	13-03-1997
		JP 4223787 A	13-08-1992
EP 0676897 A	11-10-1995	JP 7283809 A	27-10-1995
WO 9617475 A	06-06-1996	US 5654746 A	05-08-1997
		AU 688141 B	05-03-1998
		AU 3640695 A	19-06-1996
		BR 9509857 A	30-12-1997
		CA 2206234 A	06-06-1996
		EP 0795253 A	17-09-1997
		JP 10510408 T	06-10-1998
		US 6029046 A	22-02-2000

THIS PAGE BLANK (USPTO)

1/3

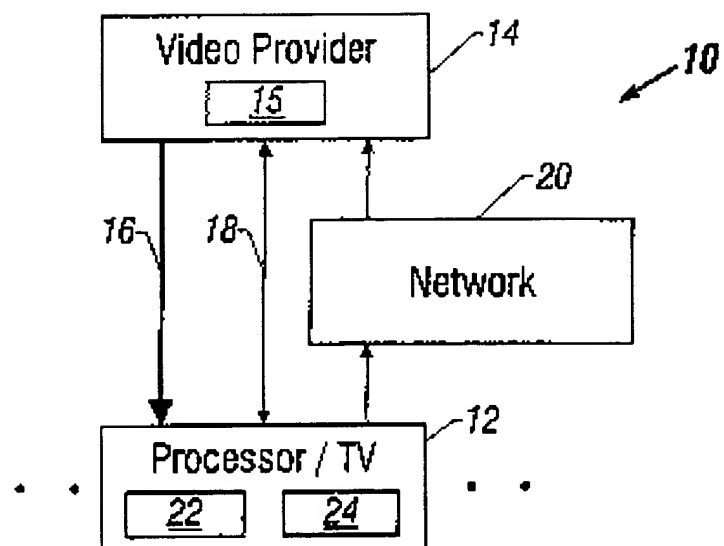


FIG. 1

2/3

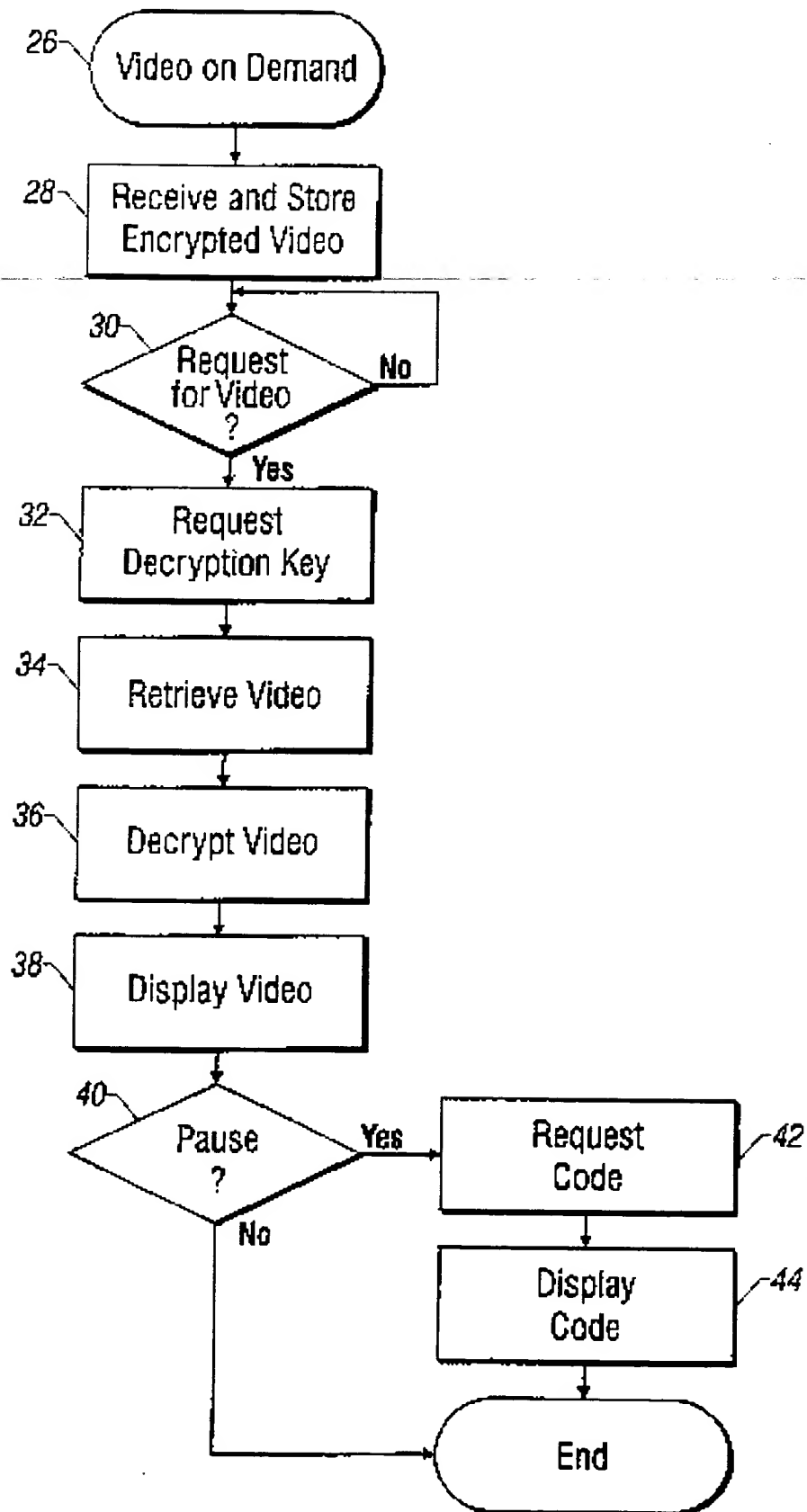


FIG. 2

3/3

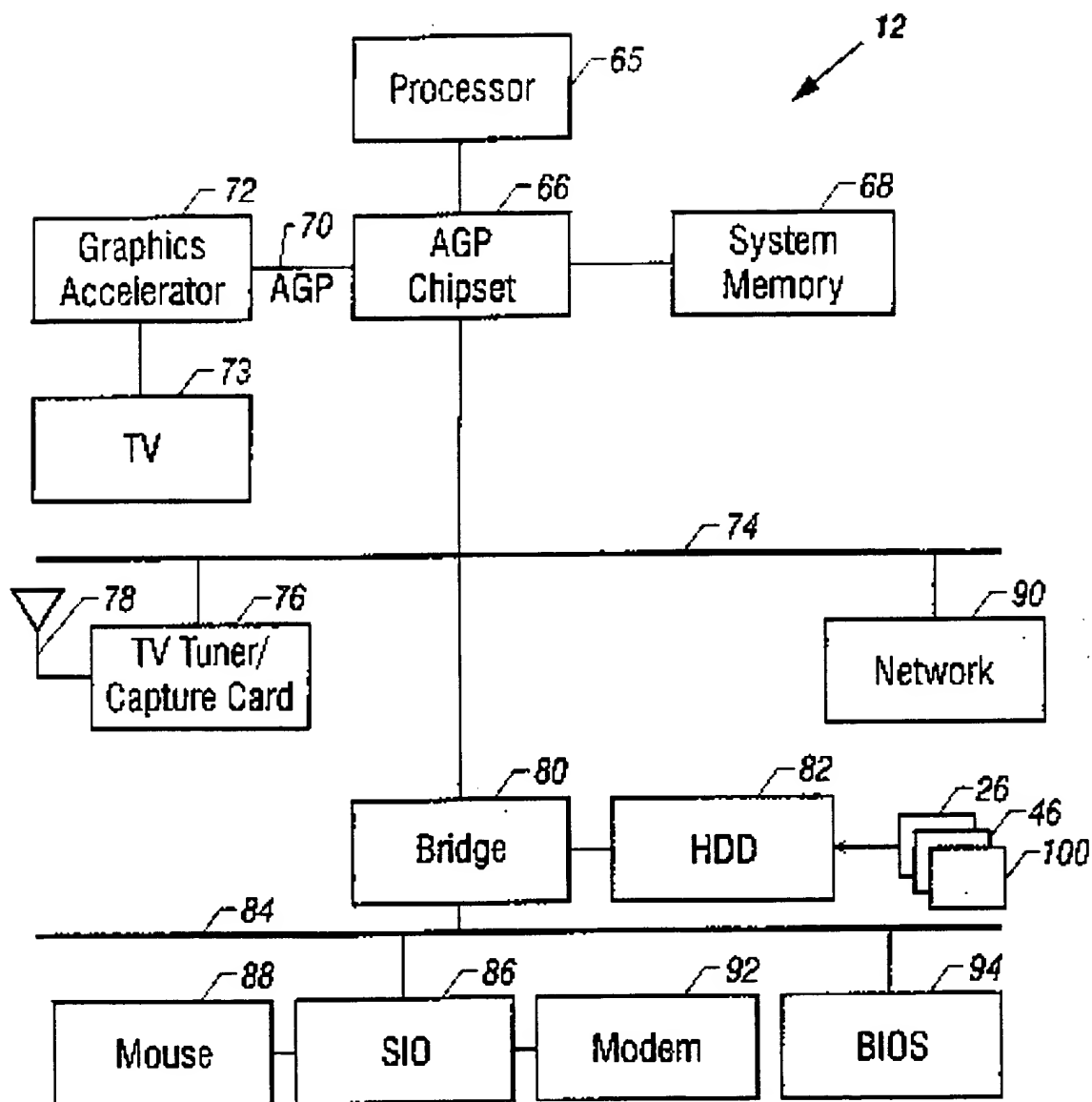


FIG. 3

THIS PAGE BLANK (USPTO)

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.

